REMARKS

Please note that the claim amendments provided above consist solely of correcting incorrect dependencies (claims 11-12), correcting incorrect capitalization (claim 14), and incorporating existing limitations regarding the Applicants template/image comparison system and method as described by the specification of the patent application into existing claims (claims 1, 6, 8, 9, and 18). Consequently, no new matter has been added, and no new search is required. Further, please note that the amendments to the specification are made in order to correct obvious typographical errors, so that the specification now conforms to the drawings as originally filed. Again, no new matter has been added as a result of these amendments.

This application is believed to be in condition for allowance because the claims, as amended, are non-obvious and patentable over the cited references. The following paragraphs provide the justification for this belief. In view of the following reasonings for allowance, the applicants hereby respectfully request further examination and reconsideration of the subject patent application.

1.0 Drawing Objections:

The Office Action objected to the drawing as failing to comply with 37 CFR1.84(p)(4) because "the reference characters "118" and "128" have both been used to designate the magnetic disk drive on page 6 of the specification". The Applicant acknowledges the typographical error identified by the Examiner. In particular, on page 6, line 6 of the specification, the Applicant inadvertently identified the magnetic disk drive as "magnetic disk drive 128," rather than "magnetic disk drive 118." In response, the applicant has amended the cited phrase to read "magnetic disk drive 118" as illustrated in the replacement paragraph provided above. This amendment is fully supported by both the specification and by Figure 1, as filed. It is believed that this amendment fully address the objection to Figure 1. Thus, the applicants respectfully request withdrawal of the objection to Figure 1 in view of the amendment to the specification.

The Office Action also objected to Figure 4. In particular, the Office Action correctly points out that the specification contained several inconsistencies with respect to Figure 4 on pages 9 and 10. Specifically, the Office Action noted that in the specification, the "first memory device" was designated as "first memory device 410," while in Figure 4, the "first memory device" was designated as "first memory device 412." Similarly, the Office Action also noted that in the specification, the "second memory device" was designated as "second memory device 412," while in Figure 4, the "second memory device" was designated as "second memory device 410." Finally, the Office Action noted that a second reference to the previously identified "host processor" was inadvertently identified as "host processor 410" rather than "host processor 408". The Applicant acknowledges these typographical error identified by the Examiner. In response the Applicant has amended the specification to conform to Figure 4. In particular, as illustrated in the replacement paragraph provided above, the reference to the "first memory device" in the specification now correctly refers to "first memory device 412," while the reference to the "second memory device" in the specification now correctly refers to "second memory device 410." Finally, the amendment now reflects that the second reference to the "host processor" correctly refers to "host processor 408." These amendments are fully supported by both the specification and by Figure 4, as filed. It is believed that these amendments fully address the objections to Figure 4. Thus, the applicants respectfully request withdrawal of the objection to Figure 4 in view of the aforementioned amendment to the specification.

2.0 Claim Objections:

The Office Action of November 19, 2002 objected to claims 6, 11 and 12 under 37 C.F.R. §1.75 as failing to particularly point out and distinctly claim the subject matter which Applicant regards as his invention or discovery.

In particular, claim 6 was objected to as failing to provide an antecedent basis for the term "models" at line 7 of the claim. The Applicant believes that "models" are inherent in "model transformations" as that term, in the context in which it is used, is clearly referring to transformations of models. However, for purposes of clarity, the Applicant has amended claim 6, as illustrated above, to replace the term "models" with the term "model

transformations." Note that for purposes of consistency, that same change has also been made to claim 8. Therefore, the Applicant submits that claim 6, as amended, now provides a proper antecedent basis. Consequently, the Applicant respectfully requests reconsideration of the objection to claim 6, as amended.

With respect to claims 11 and 12, the Examiner correctly identified an incorrect claim dependency. The Applicant has amended claims 11 and 12 as suggested by the Examiner so that rather than depending from claim 9, they now depend from claim 10. Therefore, the Applicant submits that claims 11 and 12, as amended, now provide a proper antecedent basis. Consequently, the Applicant respectfully requests reconsideration of the objection to claims 11 and 12, as amended.

3.0 Rejections Under 35 U.S.C. §112 First Paragraph:

In the Office Action of November 19, 2002, claims 6-8 and 11-20 were rejected under 35 U.S.C. §112 first paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. In particular, the Office Action suggests that the "specification describes certain (presumed) implementations of the comparison process that is not well understood as disclosed." Specifically, the Office Action suggests that although Section III of the specification discusses model generation, the interpolation of texture and the computing of statistics between color values, Section III of the specification does not discuss image comparison, and that there is "no apparent link to the image comparison disclosure of Section II." The Office Action then summarizes the misunderstood portions of the specification by suggesting that "there seem to be two distinct disclosures in the specification that are not related or reliant upon one another. While the examiner understands those portions of the specification relating to the comparison of two images (e.g. Fig. 12), the examiner does not understand how the image comparison is related to the model generation as depicted in Figs. 3-5."

However, the Applicants contend that the specification is clear on its face in view of the detailed description provided in the application. In particular, as suggested by the

Office Action, the Applicants describe a "rendering" environment in Section III. In contrast to the position advanced by the Office Action, the Applicants contend that this rendering environment is most definitely linked to the image comparison sections of the disclosure.

In particular, the "rendering" discussed by the Applicants on Page 10, lines 4-19 is clearly describing rendering as it is implemented in a typical graphics rasterizer or 3D graphics rendering device. Such graphics rasterizers are well known to those skilled in the art, and are typically found in conventional 3D graphics hardware, such as, for example, a computer 3D graphics or video card. A portion of the novelty of the Applicants invention resides in the adaptation of the use of such graphics hardware for computing statistical information which can then be compared as described. In particular, Page 10, lines 4-19 describes rendering with the following language:

> "Rendering involves drawing geometric shapes or primitives, such as polygons, into dedicated memory. It should be noted that the present invention preferably uses triangles as the drawing primitive, although there are other primitive types that could be used. In general, a single triangle can be rendered by taking three vertices v_0, v_1, v_2 with the following fields *sx sy* (the screen space coordinates of the triangle in the first memory device) *tu tv rhw* (the 2D coordinates of each vertex in the texture, and a perspective term). The address generator 414 interpolates these parameters across the triangle; for each pixel in the first memory device subtended by the triangle in screen space (*sx sy*), the second memory device is used to compute an interpolated texture value at the corresponding interpolated texture location. The comparison statistics between the two colors are then gathered, depending on the results of the acceptance test. This operation can be considered as a resampling operation being applied to the texture, which involves filtering the texture at different locations and at different densities."

Further, as described by the Applicants on page 3, line 18, through page 4, line 2, a 3D graphics rasterizer which includes a ***frame buffer*** and ***texture memory*** can be used for processing templates and images so as to gather statistics for the statistical matching described in the specification. In particular, page 3, line 18 recites the following language:

"Alternatively, the system can be implemented in a ***three-dimensional (3D) graphics rasterizer***. In this embodiment, the system includes a ***frame buffer*** (a block of graphics memory that represents the display screen) and ***texture memory*** (a block of graphics memory that can contain portions of the display screen), in addition to the components discussed above. The first set of digital data can be stored in the frame buffer while the second set of data can be stored in the texture memory. Also, ***statistical generation can be performed by the rasterizer***, with or without actually rendering or writing a 3D digital scene comprised of the digital data to the frame buffer. In this embodiment, rasterization and rendering techniques and advanced statistical generation and comparison of the present invention can be integrated to form a novel video graphics device or hardware video card for computer systems." (emphasis added)

The Applicants continue by then clearly adapting the capabilities of the graphics rasterizer to the present invention. In particular, because textured triangle rasterization resembles sparse matching of a template with an image, the Applicants describe on page 16, lines 3-13 that the texture memory and frame buffer of 3D rasterization hardware can be adapted to process the template and image to be matched in accordance with the Applicants' invention. Specifically, page 16, lines 3-13 of the present application recites the following language:

"In one specific embodiment of the example of FIG. 5, the ***template is treated as a texture and the frame buffer an image*** and the display primitive for rendering purposes is a triangular polygon. In addition, ***instead of rasterizing the texture into the frame buffer, certain statistics can be recorded for normalized correlation or other statistics can be recorded for variations***. In one example, if the texture is considered a template and the frame buffer an image, the graphics processor 513 can be used to resample the template using a perspective transformation. ***Also, the graphics processor 513 can be used to record statistics ... for later forwarding to the host processor***." (emphasis added)

Note that as described by the Applicants throughout the specification, these statistics are the basis for the template/image matching performed by the present invention.

Note also that the Office Action suggested in the rejection of claim 18, which was used to exemplify the rejections of claims 6-8 and 18-20, that the claimed "alpha blending" was not supported by the specification. In particular, the Office Action raises the following question: "[W]here is a comparison processor (that compares two images or templates) performing alpha blending?" The Office Action then continued by stating that it is unclear from the specification where the elements of claim 18 are disclosed, if at all." The Applicants respectfully disagree that such an alpha blending device is not supported. In fact, as discussed below, in the context in which the alpha blending device is implemented, it serves as a statistical weighting device rather than a device for alpha blending of two pixel colors.

In particular, in response to the question posed by the Office Action, the Applicants offer the text of page 14, lines 13-19 which clearly states the following:

> "In addition, the ***alpha values in the input colors can be used to weight the statistics***. For example, if α_T is the template alpha and α_I the image alpha, then a new α can be derived from these values by selecting one, or by doing a weighted blend between them. The resulting α could then be used to weight the pixel's contribution to the above-described statistics. Among other things, this would allow pixels to be importance-weighted by the application." (emphasis added)

Further, the Applicants also offer the text of page 15, line 26 to page 16, line 2, which clearly states the following:

> "***The alpha blending device 522*** allows use of an additional (such as a fourth) color component that is not displayed, but that ***corresponds to the opacity of a surface***. This provides control of the amount of color of a pixel in the source surface to be blended with a pixel in the destination surface." (emphasis added)

The above-cited paragraph refers to the use of an additional color component which corresponds to the "opacity of a surface." As is known and well understood by those skilled in the art, this alpha blending is simply a form of weighting a particular color for purposes of allowing a blending with another color based on a "transparency" associated with one color. However, in view of the two above-cited paragraphs, the Applicants are clearly describing a novel use of an alpha blending device in a graphics processor (See Fig. 5) for ***weighting the statistics***, which are then used in the described template/image comparisons. ***As with the frame buffer and texture memory described above, such alpha blending devices are typically found in conventional computer 3D graphics or video cards, and the Applicants have simply adapted this hardware for their use in computing the statistical information described.*** The ability to weight such statistical information for one purpose or another is provided so as to increase the flexibility of the matching capabilities described by the Applicants. Consequently, the Applicants respectfully disagree with the assertion in the Office Action that the particular use of the alpha blending device as described and claimed by the Applicants is not supported. However, in the interests of clarity, the Applicants have amended claim 18 to further clarify the particular use of the alpha blending device. In particular, claim 18, as amended now recites the following novel language:

> "The system for tracking digital templates of claim 9, wherein the compare processor comprises an ***alpha blending device*** that allows use of a color component ***for weighting statistical information used by the compare processor*** for simultaneously and statistically comparing and matching images associated with the templates for tracking the templates." (emphasis added)

In view of the preceding discussion, and in contrast to the position advanced by the Office Action, the Applicants respectfully contend that there is a clear relationship between the use of graphics rendering and statistical comparison of templates/images. Further, in view of the preceding discussion, it is clear that the specification includes descriptive support of the claimed invention that would enable one of ordinary skill in the art to make and use the claimed invention without undue experimentation. Consequently, the Applicants contend that the specification, as amended, is enabling respect to claims 6-8

and 11-20, as amended. Therefore, the Applicants respectfully request reconsideration of the rejection under 35 U.S.C. §112 first paragraph of claims 6-8 and 11-20, as amended in view of the proceeding discussion.

3.1 Rejections Under 35 U.S.C. §112 Second Paragraph:

In the Office Action of November 19, 2002, claims 6-8 and 11-20 were rejected under 35 U.S.C. §112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. In particular, the Office Action suggests that the claims 6-8 and 11-20 are drawn to an invention that lacks enablement, and that the claims can not be understood in light of the specification. However, in view of the discussion provided above in Section 3.0 of this response, the Applicants respectfully contend that the specification includes descriptive support of the claimed invention that would enable one of ordinary skill in the art to make and use the claimed invention without undue experimentation.

In addition, with respect to claim 18, the Office Action, recites elements of that claim which it is suggested have no antecedent basis, in particular, "an additional" in line 3, "the source surface" in line 4, and "the destination surface" in line 5. In addition, the Office Action provides an interpretation of claim 18 which differs substantially from the plain meaning intended by the Applicants. However, in view of the aforementioned amendment to claim 18, as illustrated above, claim 18 no longer includes any of these cited elements. Further, the Applicants contend that the meaning of claim 18, as amended, and in particular the use of the alpha blending device for weighting statistical information, is now clear. Consequently, the problems of antecedent basis and clarity of the claim have been resolved.

Consequently, the Applicants contend that the specification, as amended, is enabling respect to claims 6-8 and 11-20, as amended. Therefore, the Applicants respectfully request reconsideration of the rejection under 35 U.S.C. §112 second paragraph of claims 6-8 and 11-20, as amended, in view of the proceeding discussion.

4.0 Rejections Under 35 U.S.C. §102(b):

In the Office Action of November 19, 2002, claims 1-3, 9-7, 19 and 20 were rejected under 35 U.S.C. §102(b), as being anticipated by Neff et al. ("***Neff***," U.S. Patent 5,809,171 A). In addition, claims 1 and 4-8 were rejected under 35 U.S.C. §102(b), as being anticipated by Schott ("***Schott***," U.S. Patent 5,850,466 A).

A rejection under 35 U.S.C. §102(b) requires that the Applicant's invention was described in a printed publication more than one year prior to the date of application for patent in the United States. To establish that a printed publication describes the Applicant's invention, *all of the claimed elements of an Applicant's invention must be considered, especially where they are missing from the prior art*. If a claimed element is not taught in the referenced patent, then a rejection under 35 U.S.C. §102(b) is not proper, as the Applicants claimed invention can be shown to be patentably distinct from the cited reference.

4.1 Rejection of Claim 1-3, 9-17 and 19 over *Neff*:

With respect to claims 1 and 9, the Office Action rejected independent claims 1 and 9 under 35 U.S.C. §102(b) based on the rationale that the ***Neff*** reference discloses the Applicants claimed method for comparing and matching a first set of digital data to at least a second set of digital data. However, independent claims 1 and 9 have been amended to incorporate additional limitations not taught or suggested by the ***Neff*** reference. In particular, independent claim 1 has been amended to include "***using a graphics rasterizer*** for raster transforming at least one of the first set of digital data and the second set of digital data" (emphasis added). Similarly, independent claim 9 has been amended to include "a ***3D graphics rendering processor*** that accumulates statistics for each digital template" (emphasis added).

Clearly, the ***Neff*** reference fails to either teach or suggest the use of either a ***graphics rasterizer*** or a ***3D graphics processor*** for rasterizing the information to be used for statistical comparison purposes. Thus, it is clear that the present invention, as

claimed by independent claims 1 and 9, includes elements not taught in the ***Neff*** reference. Consequently, the rejection of claims 1 and 9, as amended, under 35 U.S.C. §102(b) is no longer proper. Therefore, the Applicant respectfully requests reconsideration of the rejection of claims 1-3, 9-17 and 19 under 35 U.S.C. §102(b) in view of the aforementioned novel claim language of claims 1 and 9, as amended.

4.2 Rejection of Claims 1 and 4-8 over *Schott*:

With respect to claims 1 and 6, the Office Action rejected independent claims 1 and 6 under 35 U.S.C. §102(b) based on the rationale that the ***Schott*** reference discloses the Applicants claimed method for comparing and matching a first set of digital data to at least a second set of digital data. However, independent claims 1 and 6 have been amended to incorporate additional limitations not taught or suggested by the ***Schott*** reference. In particular, as noted above, independent claim 1 has been amended to include "***using a graphics rasterizer*** for raster transforming at least one of the first set of digital data and the second set of digital data" (emphasis added). Similarly, independent claim 6 has been amended to include "using ***a 3D graphics rendering device*** for rendering model transformations and accumulating statistics of the loaded digital data" (emphasis added).

Clearly, the ***Schott*** reference fails to either teach or suggest the use of either a ***graphics rasterizer*** or a ***3D graphics rendering device*** for accumulating statistical information. Thus, it is clear that the present invention, as claimed by independent claims 1 and 6, includes elements not taught in the ***Schott*** reference. Consequently, the rejection of claims 1 and 6, as amended, under 35 U.S.C. §102(b) is no longer proper. Therefore, the Applicant respectfully requests reconsideration of the rejection of claims 1 and 4-8 under 35 U.S.C. §102(b) in view of the aforementioned novel claim language of claims 1 and 6, as amended.

VERSION OF CLAIMS WITH MARKINGS TO SHOW CHANGES MADE

1. A method for comparing and matching a first set of digital data to at least a second set of digital data, comprising:

using a graphics rasterizer for raster transforming at least one of the first set of digital data and the second set of digital data; and

statistically comparing and matching the raster transformed sets of digital data to appropriately corresponding portions of each other.

6. A method for comparing and matching a first set of digital data to at least a second set of digital data, comprising:

loading at least one of the first and second sets of digital data into a first memory device;

using a 3D graphics rendering device for rendering model transformations and accumulating statistics of the loaded digital data;

adjusting the [models] model transformations based on the accumulated statistics; and

statistically comparing and matching the model transformations of the loaded set of digital data to appropriately corresponding portions of the other set of digital data.

8. The method of claim 6, wherein adjusting the [models] model transformations comprises analyzing the statistical comparisons and generating new transformations for matching the sets of data.

9. A system for tracking digital templates of a digital scene defined by plural images, comprising:

a raster processor that transforms at least one of the templates;

a 3D graphics rendering processor that accumulates information for each digital template; and

a compare processor that simultaneously and statistically compares and matches images associated with the templates for tracking the templates based on the accumulated information.

11. The system for tracking digital templates of claim [9] 10, wherein the addresses reflect transformations, including combinations of rotations, scales and perspective transforms of the template or image.

12. The system for tracking digital templates of claim [9] 10, wherein the addresses serve as input to filtering functions that read from the images to be compared and generate color values.

14. The system for tracking digital templates of claim 13, wherein [If] if the pixel is permitted to contribute, the color values are sent to a statistics/comparison device for statistical analyses and comparison processing.

18. The system for tracking digital templates of claim 9, wherein the compare processor comprises an alpha blending device that allows use of [an additional] a color component for weighting statistical information used by the compare processor for simultaneously and statistically comparing and matching images associated with the templates for tracking the templates [that corresponds to the opacity of a surface for controlling the amount of color of a pixel in the source surface to be blended with a pixel in the destination surface].

VERSION OF REPLACEMENT PARAGRAPHS WITH MARKINGS TO SHOW CHANGES MADE

1. The paragraph on page 5, line 18 through page 6, line 8 has been amended to correct a typographical error noted by the Office Action. Specifically, as illustrated below, one reference to element "128" has been replaced with a reference to element "118":

> -- With reference to FIG. 1, an exemplary system for implementing the invention includes a general-purpose computing device in the form of a conventional personal computer 100, including a processing unit 102, a system memory 104, and a system bus 106 that couples various system components including the system memory 104 to the processing unit 102. The system bus 106 may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. The system memory includes read only memory (ROM) 110 and random access memory (RAM) 112. A basic input/output system 114 (BIOS), containing the basic routines that help to transfer information between elements within the personal computer 100, such as during start-up, is stored in ROM 110. The personal computer 100 further includes a hard disk drive 116 for reading from and writing to a hard disk, not shown, a magnetic disk drive 118 for reading from or writing to a removable magnetic disk 120, and an optical disk drive 122 for reading from or writing to a removable optical disk 124 such as a CD ROM or other optical media. The hard disk drive 116, magnetic disk drive [128] 118, and optical disk drive 122 are connected to the system bus 106 by a hard disk drive interface 126, a magnetic disk drive interface 128, and an optical drive interface 130, respectively. The drives and their associated computer-readable media provide nonvolatile storage of computer readable instructions, data structures, program modules and other data for the personal computer 100. Although the exemplary environment described herein employs a hard disk, a removable magnetic disk 120 and a removable optical disk 124, it should be appreciated by those skilled in the art that other types of computer readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks,

Bernoulli cartridges, random access memories (RAMs), read only memories (ROM), and the like, may also be used in the exemplary operating environment. --

2. The paragraph on page 9, line 19 through page 10, line 3 has been amended to correct several typographical errors noted by the Office Action. Specifically, as illustrated below, the "first memory device" was inadvertently identified as "first memory device 410" when, as illustrated by Figure 4, it should clearly have been identified as "first memory device 412". Similarly, the "second memory device" was inadvertently identified as "second memory device 412" when, as illustrated by Figure 4, it should clearly have been identified as "second memory device 410". Finally, a second reference to the previously identified "host processor" was inadvertently identified as "host processor 410" rather than "host processor 408". As illustrated in the marked up version of the subject paragraph provided below, these typographical errors have been corrected:

-- FIG. 3 is a flow diagram of the operation of the present invention and FIG. 4 is a general block diagram of the present invention. Referring to FIG. 3 along with FIGS. 4 and 2, first, new sets of data, such as an image and/or a template is acquired (step 310) by the system 400 and initialized by the host processor 408. The host processor 408 can store the new sets of data in the memory devices. For instance, the first set of data, such as the template can be loaded into a first memory device **[**410**]** <u>412</u> and the second set of data, such as the image can be loaded into a second memory device **[**412**]** <u>410</u>. Second, models, such as two-dimensional (2D) or three-dimensional (3D) models, are rendered and statistics are accumulated (step 312) by the host processor **[**410**]** <u>408</u> for the template and the image. Rendering and statistical accumulation can be accomplished with an address generator 414 and an acceptance tester 416, which will be discussed in detail below. --

CONCLUSION

In view of the above, it is respectfully submitted that claims 1-20, as amended, are in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of claims 1-20, and to pass this application to issue. Additionally, in an effort to further the prosecution of the subject application, the Applicant kindly invites the Examiner to telephone the Applicant's attorney at (805) 278-8855 if the Examiner has any questions or concerns.

Respectfully submitted,

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